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HISTOPATHOLOGY AND SERUM CLINICAL CHEMISTRY EVALUATION OF BROILERS WITH FEMORAL HEAD SEPARATION DISORDER†

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Study Results

The results of this study suggest that femoral head separation (FHS) may be a metabolic problem in poultry that is related to fat metabolism disorders possibly contributing to an unbalanced growth in articular-epiphyseal complex that leads its separation under sheer stress.

Significance of Study Results

Rapid growth in meat-type poultry has been implicated in the epiphyseal separation and subsequent problems such as infection. There is a need to understand the pathologic basis of this problem and its clinical correlates for its prognosis and to determine the risk factors early on. Since blood chemistry changes are classically used as indicators of different health problems, researchers were interested in evaluating the changes in blood chemistry of chickens with predilection to femoral separation along with histopathologic changes occurring in the affected growth plates (Figures 1 and 2). Whether it is an imbalance in lipid metabolism or other idiopathic causes that may have contributed to the elevation of blood lipid levels in subgroups of chickens with FHSL remains to be understood. The results, nevertheless, suggest that elevated lipid levels may be a risk factor, possibly a surrogate marker, for femoral head problems in chickens. It is likely that irregular growth in the articular-epiphyseal complex increases its vulnerability to damage and femoral separation under sheer stress.

Additional Information

Separation of femoral epiphysis from its articular cartilage with or without necrosis is a common leg problem in meat-type poultry where it is referred to as proximal femoral head degeneration, epiphysiolysis, osteochondrosis, and femoral head necrosis (FHN). This problem is of major concern in the poultry industry because it affects the performance of broiler breeders. Femoral head damage likely leads to FHN and osteomyelitis since it breaches the physiological barrier against infections. In humans, FHN is linked to the avascularity of subchondral bone resulting from idiopathic trauma such as repetitive mechanical stress in weight bearing joints and chronic usage of angiostatic factors such as the glucocorticoids and gamma interferon that induce avascularity. In patients with hereditary Legg-Calve-Perthes disease, FHN is known to occur in young patients where the growth plate is affected. ''Slipped epiphysis'' is another condition that occurs in adolescent patients that results from partial or complete tearing away of epiphysis leading to aseptic necrosis. This condition also occurs in pigs, cattle, horses, and dogs where it is generally referred to as osteochondrosis resulting from vascular defects. However, the etiological basis of femoral head separation and physeal tearing in young poultry is not understood or at most limited. In contrast to humans where avascular necrosis often involves subchondral bone, the chicken problem relates to growth plate separation in actively growing birds.

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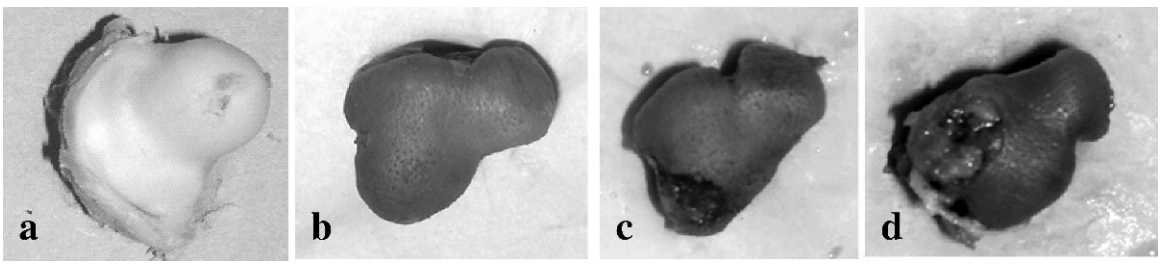

Fig. 1. Axial view of proximal end of femoral heads. (a) An intact femoral head with articular cartilage covering growth plate, (b) femoral growth plate separated from articular cartilage (FHS) showing no lesions and (c, d) femoral growth plate separated from articular cartilage showing extensive cartilage tearing and lesions.

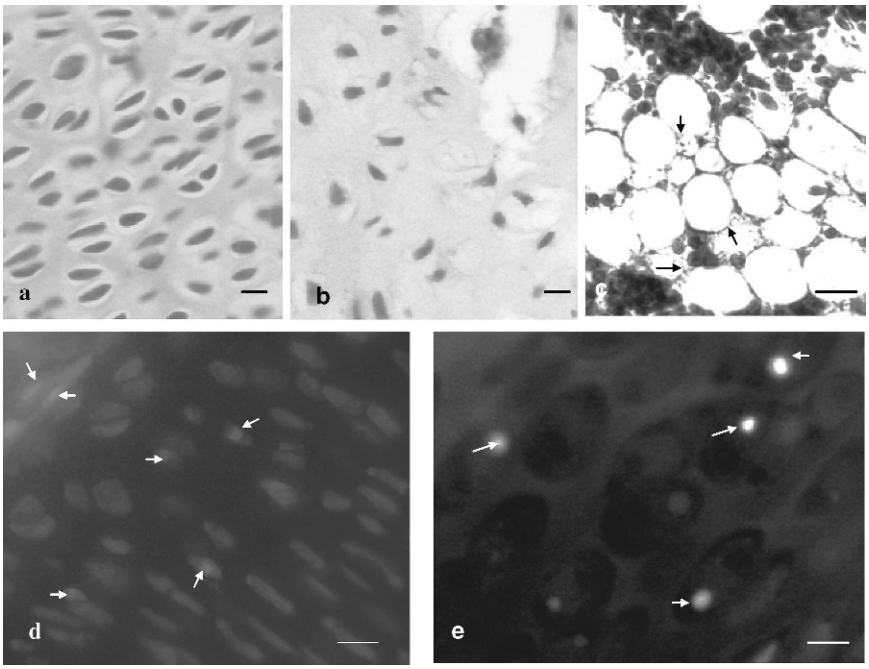

Fig. 2. Histology of femoral head growth plates from control and FHSL affected chickens. Normal growth plate showing prehypertrophic chondrocytes (a); an affected area showing hypocellularity and dysplastic chondrocytes (b); metaphyseal bone marrow with chromogenic deposits in the adipocyte lacunae (c); TUNEL labeled section from a FHSL growth plate (d) and an area of FHSL growth plate showing necrotic chondrocytes stained with Hoechst dye 33258 (e). Arrows indicate deposits in the adipocyte lacunae in (c), apoptotic chondrocytes in (d), and condensed chondrocytes in (e). Bar = 10 μm.